Legal Error, Managerial Liability and Negative Externality

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Abstract:

This paper examines the social efficiency of managerial liability rules when firms may cause negative externality. If courts fail to recognize potential negative externality in a firm's activities, then they can mistakenly find managers who may have prevented the externality at a cost to the firm beforehand liable for breaches of fiduciary duty to shareholders, and mistakenly impose legal liability sanctions on the managers. This possibility discourages managers from choosing socially optimal actions. To overcome this problem, I suggest that managers, not shareholders, should be directly liable for negative externality and that managers' fiduciary duty to shareholders should be restricted.

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This paper examines the social efficiency of managerial liability rules when firms may cause negative externality. I suggest that managers, not shareholders, should be directly liable for negative externality caused by corporate activities, and that managers' fiduciary duty to shareholders should be restricted. This suggestion arises from two presumptions: that there is a legal error by which courts fail to adequately recognize an external harm caused by corporate activities, and that legal processes are necessary to impose penalties (or negative compensation) on managers.

Shareholders finally bear the cost of an external harm caused by corporate activities if courts can adequately internalize the externality. Therefore, shareholders motivate managers to attain the social optimum, irrespective of whether the legal liability sanctions for the externality are directly imposed on shareholders or on managers.[1] Hence, managers act as agents of shareholders to solve the problem causing the negative externality.

However, if courts fail to internalize an external harm and legal liability sanctions imposed on managers for breaches of fiduciary duty to shareholders are restricted, then there is a social difference between the legal liability sanctions for the negative

[1] See Becker (1968) for internalization of negative externality.

externality being directly imposed on shareholders or managers. The reason for this is as follows. When shareholders are directly liable for an external harm, they ignore the externality if a legal error sufficiently lowers the expected sanctions for the externality imposed on them.[2] In contrast, when managers are directly liable for an external harm, restriction of legal liability sanctions imposed on them for breaches of fiduciary duty to shareholders has a great influence on the relationship between shareholders' interests and social objectives. Legal liability sanctions are often the only way to impose negative compensation on managers.[3] Therefore, reinforcement of legal liability sanctions imposed on managers for breaches of fiduciary duty to shareholders makes managerial incentive schemes more efficient from the shareholders' perspectives. However, more efficient managerial incentive schemes from the shareholders'

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[2] As literature on economic consequences of legal error, see, for example, Craswell and Calfee (1986), Png (1986), Polinsky and Shavell (1989), Miceli (1990), Davis (1994), and Kaplow and Shavell (1994).

[3] This assumption seems to be realistic because legal processes are often necessary to seize managers' property after the results of their performance, whereas firms have difficulty in keeping managers' property before the results of their performance. As a model similar to this framework, see Gutierrez (2003). As literature on limited liability constraints in principal-agent models, see, for example, Holmstrom (1979), Lewis (1980), Sappington (1983), Demski, Sappington, and Spiller (1988), Innes (1990), Park (1995), Kim (1997), Demougin and Fuet (1998), Lewis and Sappington (2000, 2001), and Laux (2001).

perspectives are not necessarily more favorable from a social perspective when corporate activities may cause negative externality. If courts fail to recognize potential negative externality in an firm's activities, then they can mistakenly find managers who may have prevented the externality at a cost to the firm beforehand liable for breaches of fiduciary duty to shareholders. Therefore, they mistakenly impose legal liability sanctions on the managers.

When legal liability sanctions imposed for breaches of fiduciary duty are sufficiently large, managers are discouraged, even if they are directly liable for an external harm, from choosing socially optimal actions. That is, reinforcement of fiduciary duty to shareholders can threaten managers not to choose socially optimal actions that are against shareholders' interests, irrespective of whether legal liability for negative externality is imposed on shareholders or managers. In contrast, when legal liability sanctions for breaches of fiduciary duty are restricted, shareholders cannot impose penalties on managers for acting against shareholders' interests and, instead, have to pay additional rewards to managers for obeying shareholders (acting against social objectives) if managers are directly liable for negative externality. That is, a restriction of legal liability sanctions imposed on managers for breaches of fiduciary duty can raise the cost of motivating managers to act against social objectives and to

obey shareholders. Consequently, this can mitigate the conflict between shareholders' interests and social objectives.

Thus, by imposing legal liability for negative externality on managers and restricting legal liability imposed for managers' breaches of fiduciary duty to shareholders, courts may be able to attain the social optimum even if they cannot sufficiently internalize the externality. In other words, managers should not just be agents of shareholders who are directly liable for negative externality, but should be directly liable for the externality. At the same time, managers' fiduciary duty should be balanced with other legal liabilities imposed on them.[4]

The remainder of the paper is organized as follows. Section I presents the benchmark model in which negative compensation paid to managers is unlimited, that is, where legal liability sanctions imposed on managers for breaches of fiduciary duty are unnecessary. Section II analyzes this model and shows that shareholders motivate managers to attain the social optimum if and only if courts adequately internalize negative externality, irrespective of whether the legal liability for the externality is imposed on shareholders or managers. Section III shows that the nonnegative constraint

[4] On substitutability of the principal and agent liability, see, for example, Polinsky and Shavell (1993), Arlen (1994), Chu and Qian (1995), Shavell (1997), Privileggi et al. (2001), and Mattiacci and Parisi (2004). However, these studies do not explicitly analyze the relationship between managers' liability related to social harms and their fiduciary duty to shareholders.

of managerial compensation can raise the cost of motivating managers to act against social objectives and to obey shareholders when managers are directly liable for negative externality. Section IV introduces legal liability for breaches of fiduciary duty into managerial incentive schemes. It is shown that reinforcement of legal liability sanctions imposed on managers for breaches of fiduciary duty can threaten them so that they do not choose socially optimal actions that are against shareholders' interests. Section V draws concludes.

I. The benchmark model: The case in which negative compensation is unlimited

Consider a firm that has an opportunity to implement one of two Projects, A and B. Let R_i denote a return from Project i net of investment costs, where $i \in \{A, B\}$. Project A involves no negative externality while Project B causes an external harm E with probability π. That is, a causal relationship between Project B and its negative externality is uncertain. This would be the case, for example, in respect of the possibility and gravity of pollutant leakage from a factory. However, this causality can be correctly recognized only by the firm's manager before project selection. Therefore, the firm's shareholders have to delegate project selection to the manager, but the realized return reveals the project actually chosen by the manager. After the outcome of

the chosen project is realized, the court imperfectly recognizes the causal relationship between Project B and its negative externality: if Project B causes the external harm E, the court correctly finds this causality with probability p_C; if Project B involves no negative externality, the court correctly recognizes this fact with probability p_N. The court's ability to find the causal relationship is assumed to be independent of the manager's project selection. That is, when the manager does not implement Project B, the court estimates the potential negative externality of this project from similar cases.[5] Assume that $p_C + p_N > 1$: the court's ruling contains useful information on whether project B causes negative externality.

In addition, assume the following condition:

$$0 \leq R_B - E < R_A < R_B - p_C E . \tag{1}$$

[5] In reality, the court's ability to find the causal relationship between Project *B* and its negative externality may depend on which project the manager chose. For example, when the manager implemented Project *B*, the court may be able to directly observe the fact that the manager caused the external harm *E*. However, even if the court's ability to find the causal relationship is assumed to depend on the manager's project selection, the following analysis is fundamentally unchanged. It is essential for this paper that there is a time lag between when the manager and the court recognize the causal relationship.

The first inequality of (1) means that limited liability of shareholders is not binding because the court can impose all of the external harm E on the firm (i.e., on the shareholders).[6] The second inequality means that if Project B causes the external harm E, then Project A is socially more acceptable than Project B. The final inequality means that if Project B involves no negative externality, then Project B is socially more acceptable than Project A. However, this inequality means that when the court imposes the compensatory damage E on the firm that was held liable for negative externality, the expected liability sanction $p_C E$ imposed on the firm that caused the external harm E is sufficiently low such that Project B is always more beneficial to shareholders than Project A. In other words, if a legal liability sanction D satisfying $R_B - p_C D < R_A < R_B - (1 - p_N)D$, i.e., satisfying

$$\frac{R_B - R_A}{p_C} < D < \frac{R_B - R_A}{1 - p_N} \tag{2}$$

[6] This condition is not essential. If E is greater than R_B, i.e., if limited liability of shareholders is binding, the legal liability sanction for negative externality is not E but R_B. However, in this case, if inequality (1) is replaced by $0 < R_A < R_B - p_C R_B$, the following analysis is invariant.

is imposed on the firm that was held liable for the external harm E, the conflict between shareholders' interests and social objectives disappear. The first inequality of (2) assures that the shareholders choose Project A when Project B causes negative externality. The second inequality assures that the shareholders choose Project B when it involves no negative externality. However, for the remainder of this paper it is assumed that the court imposes only the compensatory damage E and does not impose punitive damage on the firm. That is, the court cannot adequately internalize negative externality.[7]

Assume that

$$\pi R_A + (1-\pi)R_B - (1-\pi)(1-p_N)E - \bar{u} > 0, \tag{3}$$

where $\bar{u}$ (≥ 0) denotes the manager's reservation level of utility. Inequality (3) assures that the firm gains from the socially optimal project selection on condition that the

[7] Punitive damages tend to be restricted in many countries. This tendency is strengthened when corporate social responsibilities are gradually made into law. Even if punitive damages are not restricted, courts are likely to underestimate their legal error. Therefore, they may not be able to impose sufficiently large liability sanctions on defendants.

expected net compensation paid to the manager is $\overline{u}$. This inequality also assures that the socially optimal project selection yields a positive social surplus: $\pi R_A + (1-\pi) R_B - \overline{u} > 0$.

The timing of the game is as follows. At $t=1$, the firm's shareholders offer the following contract to the manager: the shareholders pay W_i to the manager when a return R_i is realized, where $i \in \{A, B\}$. At $t=2$, the manager recognizes whether Project B will cause the external harm E or not and decides which project to choose. At $t=3$, a return from the project chosen by the manager is realized. At $t=4$, if the manager chooses Project B at $t=2$, those exposed to the danger of the external harm E necessarily accuse the manager. If the court finds the negative externality of Project B, a legal liability sanction E is imposed on the shareholders or the manager. For simplicity, all legal costs are assumed to be zero. Importantly, legal liability sanctions are finally borne by the shareholders even if they are directly imposed on the manager. In fact, as shown in the next section, if negative compensation paid to the manager is unlimited, there is no social difference between whether legal liability sanctions for negative externality are directly imposed on the shareholders or on the manager. However, this conclusion is untrue if negative compensation is limited, as shown later.

II. Managerial incentives in the benchmark model

Assume that negative compensation paid to the manager is unlimited. Then, it is shown that the most beneficial project selection for the shareholders is to choose Project B irrespective of whether it will cause negative externality or not. For the remainder of this section, the legal liability for the external harm E is directly imposed on the manager. This setting is not essential because when negative compensation is unlimited, there is no social difference between the legal liability for negative externality being directly imposed on the shareholders or on the manager, as shown below. Let $\left(W_A^*, W_B^*\right)$ denote a pair of $\left(W_A, W_B\right)$ that maximizes shareholders' profit when negative compensation paid to the manager is unlimited. There are four cases, as follows:

Case 1: choosing Project A when Project B will cause negative externality and choosing Project B when it will involve no negative externality;

Case 2: choosing Project B irrespective of whether it will cause negative externality or not;

Case 3: choosing Project A irrespective of whether Project B will cause negative externality or not;

Case 4: choosing Project B when it will cause negative externality and choosing

Project A when Project B will involve no negative externality.

Case 1 is socially optimal as assumed in (1). Whereas, Case 4 can be ignored as it is never chosen by the shareholders because if they prefer Project A over Project B even when Project B involves no negative externality, this preference is strengthened when Project B will cause negative externality. Managerial incentive schemes in Cases 1~3 are as follows.

Firstly, consider managerial incentive schemes in Case 1. At $t=1$, the shareholders offer a contract $\left(W_A, W_B\right)$ to the manager in order to motivate him/her to choose Project A when Project B will cause negative externality and to choose Project B when it will involve no negative externality. Then, the manager's participation constraint is

$$\pi W_A + \left(1-\pi\right)W_B - \left(1-\pi\right)\left(1-p_N\right)E \geq \bar{u}. \tag{4}$$

The manager's incentive compatibility constraint is

$$W_B - p_C E \leq W_A \leq W_B - \left(1-p_N\right)E. \tag{5}$$

The shareholders maximize their profit $\pi R_A + (1-\pi)R_B - \pi W_A - (1-\pi)W_B$ subject to (4) and (5). This is equivalent to minimizing $\pi W_A + (1-\pi)W_B$ subject to (4) and (5). Therefore,

$$\pi W_A^* + (1-\pi)W_B^* = \bar{u} + (1-\pi)(1-p_N)E; \tag{6}$$

$$\bar{u} - (1-\pi)(p_C + p_N - 1)E \le W_A^* \le \bar{u}. \tag{7}$$

The bold line in Figure 1 shows the region of a pair of (W_A^*, W_B^*) in Case 1. It follows from (6) that the shareholders' profit is

$$\begin{aligned}&\pi R_A + (1-\pi)R_B - \pi W_A^* - (1-\pi)W_B^* \\ &= \pi R_A + (1-\pi)R_B - (1-\pi)(1-p_N)E - \bar{u},\end{aligned}$$

which is equal to (3).

Secondly, consider managerial incentive schemes in Case 2. At $t=1$, the shareholders offer a contract (W_A, W_B) to the manager in order to motivate him/her to

choose Project B irrespective of whether it will cause negative externality or not. Then, the manager's participation constraint is

$$W_B - \left\{\pi p_C + (1-\pi)(1-p_N)\right\}E \geq \bar{u}. \tag{8}$$

The manager's incentive compatibility constraints are

$$W_B - p_C E \geq W_A; \tag{9}$$

$$W_B - (1-p_N)E \geq W_A.$$

Because the latter inequality is assured by the former inequality (9), the shareholders maximize their profit $R_B - W_B$ subject to (8) and (9). This is equivalent to minimizing W_B subject to (8) and (9). Therefore,

$$W_A^* \leq \bar{u} - (1-\pi)(p_C + p_N - 1)E; \tag{10}$$

$$W_B^* = \bar{u} + \left\{\pi p_C + (1-\pi)(1-p_N)\right\}E. \tag{11}$$

The bold line in Figure 2 shows the region of a pair of $\left(W_A^*, W_B^*\right)$ in Case 2. It follows from (11) that the shareholders' profit is

$$R_B - W_B^* = R_B - \left\{\pi p_C + \left(1-\pi\right)\left(1-p_N\right)\right\}E - \overline{u}. \tag{12}$$

Finally, consider managerial incentive schemes in Case 3. At $t=1$, the shareholders offer a contract $\left(W_A, W_B\right)$ to the manager in order to motivate him/her to choose Project A irrespective of whether Project B will cause negative externality or not. Then, the manager's participation constraint is

$$W_A \geq \overline{u}. \tag{13}$$

The manager's incentive compatibility constraints are

$$\begin{aligned} &W_B - p_C E \leq W_A; \\ &W_B - \left(1-p_N\right)E \leq W_A. \end{aligned} \tag{14}$$

Because the former inequality is assured by the latter inequality (14), the shareholders maximize their profit $R_A - W_A$ subject to (13) and (14). This is equivalent to minimizing W_A subject to (13) and (14). Therefore,

$$W_A^* = \overline{u}\,, \tag{15}$$

$$W_B^* \le \overline{u} + \left(1 - p_N\right)E. \tag{16}$$

The bold line in Figure 3 shows the region of a pair of $\left(W_A^*, W_B^*\right)$ in Case 3. It follows from (15) that the shareholders' profit is

$$R_A - W_A^* = R_A - \overline{u}\,. \tag{17}$$

It follows from $p_C + p_N > 1$, (1), (3), (12) and (17) that Case 2 is the best , Case 1 is the second best, and Case 3 is the worst for the shareholders. Thus, while it is socially optimal to choose Project A when Project B will cause negative externality and to choose Project B when it will involve no negative externality, it is most beneficial for the shareholders that Project B is chosen irrespective of whether it will

cause negative externality or not.

The following proposition is obtained.

Proposition 1: When negative compensation paid to the manager is unlimited, there is no social difference between the legal liability for negative externality being directly imposed on the shareholders or on the manager.

Proof: All proofs are contained in the Appendix.

As shown in the proof of this proposition, in Cases 1 and 3, even if negative compensation is infeasible (i.e., even if $W_A \geq 0$ and $W_B \geq 0$), the shareholders' profit-maximization problem is independent of whether legal liability for negative externality is directly imposed on the shareholders or on the manager. However, in Case 2, conditions (10) and (11) may not be consistent with $W_A \geq 0$ and $W_B \geq 0$ while conditions (A. 6) and (A. 7) are always consistent with $W_A \geq 0$ and $W_B \geq 0$. Therefore, the shareholders' profit-maximization problem is no longer independent of whether legal liability for negative externality is directly imposed on the shareholders or on the manager. This problem is examined in the subsequent sections.

III. The nonnegative constraint of managerial compensation and the legal liability for negative externality

As shown in the previous section, when negative compensation paid to the manager is unlimited, shareholders have an incentive to adopt the socially inefficient project selection, i.e., to choose Project B irrespective of whether it will cause negative externality. This section assumes that managerial compensation cannot be negative: $W_A \geq 0$ and $W_B \geq 0$. To motivate the manager to choose Project B irrespective of whether it will cause negative externality or not (i.e., to motivate him/her to choose Case 2), the shareholders have to satisfy the manager's incentive compatibility $W_B \geq p_C E$ that is obtained from inequality (9) and $W_A \geq 0$. However, the manager's participation constraint remains (8). Therefore, the nonnegative constraint of managerial compensation is binding if and only if

$$p_C E > \bar{u} + \left\{\pi p_C + (1-\pi)(1-p_N)\right\}E, \tag{18}$$

which is equivalent to

$$p_C > (1-p_N) + \frac{\bar{u}}{(1-\pi)E}. \tag{18'}$$

Let $\left(W_A^{**}, W_B^{**}\right)$ denote a pair of $\left(W_A, W_B\right)$ that maximizes shareholders' profit when managerial compensation cannot be negative. If (18) is satisfied,

$$W_A^{**} = 0; \tag{10'}$$

$$W_B^{**} = p_C E. \tag{11'}$$

Point V in Figure 2 shows the only pair of $\left(W_A^{**}, W_B^{**}\right)$ in Case 2 when (18) holds. Parameters exist satisfying (18') because, by increasing both p_C and E such that $\left(R_B - p_C E\right) - \left(R_B - E\right) = \left(1 - p_C\right)E$ is kept constant and simultaneously increasing R_B, inequalities $p_C + p_N > 1$, (1), (3) and (18') can be assured.

When (18) is satisfied, it is more costly for the shareholders to motivate the manager who is directly liable for negative externality to always choose Project B, because the shareholders cannot impose penalties on the manager for acting against their interests. Instead, they have to pay additional rewards, given by $p_C E - \left[\overline{u} + \left\{\pi p_C + \left(1 - \pi\right)\left(1 - p_N\right)\right\}E\right]$, to the manager for obeying them (i.e., for acting against social objectives). This may encourage the shareholders to adopt the socially

optimal project selection. The shareholders' profit in Case 2 is

$$R_B - W_B^{**} = R_B - p_C E, \tag{12'}$$

which is less than (12) when (18) is satisfied. In contrast, the nonnegative constraint of managerial compensation is not binding in Cases 1 and 3.

It follows from (3), (12'), and (17) that the following proposition is obtained.

Proposition 2: When the nonnegative constraint of managerial compensation is binding, i.e., when (18') is satisfied, the shareholders motivate the manager to always choose the socially optimal project if and only if

$$p_C > \frac{\pi\left(R_B - R_A\right) + \bar{u}}{E} + \left(1-\pi\right)\left(1-p_N\right). \tag{19}$$

There exist parameters satisfying (19) because it follows from (1) and (18') that the right-hand side of (19) is $\frac{\pi\left(R_B - R_A\right)}{E} + \frac{\bar{u} + \left(1-\pi\right)\left(1-p_N\right)E}{E} < \pi + \left(1-\pi\right) = 1$, which is assured by $\frac{R_B - R_A}{E} < 1$ and $\left(1-p_N\right) + \frac{\bar{u}}{\left(1-\pi\right)E} < 1$. Inequality (19) can be transformed into

$$\pi\left\{\left(R_B - p_C E\right) - R_A\right\} < \underbrace{p_C E}_{W_B^{**}} - \underbrace{\left[\bar{u} + \left\{\pi p_C + \left(1-\pi\right)\left(1-p_N\right)\right\}E\right]}_{W_B^{*}},$$

which means that the cost to the shareholders of motivating the manager to always choose Project B is greater than the benefit to them of doing so.

Thus, when a penalty is directly imposed on managers for acting against social objectives, a penalty for acting against shareholders' interests is also necessary to motivate managers to obey shareholders (to act against social objectives). However, the nonnegative constraint of managerial compensation makes it infeasible to impose the latter penalty on managers. Instead, it forces shareholders to pay additional rewards to managers for obeying them. This can raise the cost of motivating managers to act against social objectives and to obey shareholders. Consequently, this can mitigate the conflict between shareholders' interests and social objectives. Note that the nonnegative constraint of managerial compensation is not binding when the shareholders are directly liable for negative externality, as shown in (A. 4) and (A. 5). Hence, there is a social difference between legal liability sanctions for negative externality being directly imposed on shareholders or on managers. In contrast, introduction of legal liability

sanctions for breaches of fiduciary duty to shareholders into managerial incentive schemes can be a substitute for negative compensation imposed on managers and may exacerbate the conflict between shareholders' interests and social objectives. This problem is examined in the next section.

IV. Introduction of fiduciary duty into managerial incentive schemes

At $t=4$, if the manager chooses Project A at $t=2$, the shareholders necessarily accuse the manager of breaches of fiduciary duty to them. If the court does not find the potential negative externality of Project B, a legal liability sanction $R_B - R_A$ is imposed on the manager for breaches of fiduciary duty. The court recognizes, with probability p_N, that Project B will involve no negative externality and imposes a sanction $R_B - R_A$ on the manager who chose Project A for breaches of fiduciary duty. However, the court fails to recognize, with probability $1-p_C$, that Project B will cause negative externality and mistakenly imposes a sanction $R_B - R_A$ on the manager who chose Project A. Let $\left(W_A^{***}, W_B^{***}\right)$ denote a pair of $\left(W_A, W_B\right)$ that maximizes the shareholders' profit when managerial compensation cannot be negative, but legal liability sanctions for breaches of fiduciary duty are imposed on the manager.

In Case 1, the manager's participation constraint is

$$\pi W_A + (1-\pi)W_B - \pi(1-p_C)(R_B - R_A) - (1-\pi)(1-p_N)E \geq \bar{u}. \qquad (4')$$

The manager's incentive compatibility constraints are

$$W_B - p_C E \leq W_A - (1-p_C)(R_B - R_A);$$

$$W_B - (1-p_N)E \geq W_A - p_N(R_B - R_A),$$

which are equivalent to

$$W_B + (1-p_C)(R_B - R_A) - p_C E \leq W_A \leq W_B + p_N(R_B - R_A) - (1-p_N)E. \qquad (5')$$

Therefore,

$$\pi W_A^{***} + (1-\pi)W_B^{***} = \bar{u} + \pi(1-p_C)(R_B - R_A) + (1-\pi)(1-p_N)E; \qquad (6')$$

$$\bar{u} + (1-p_C)(R_B - R_A) - (1-\pi)(p_C + p_N - 1)E \leq W_A^{***}$$

$$\leq \bar{u} + \left\{\pi\left(1 - p_C\right) + \left(1 - \pi\right)p_N\right\}\left(R_B - R_A\right). \qquad (7')$$

The following proposition is obtained.

Proposition 3: There exist $W_A^{***} \geq 0$ and $W_B^{***} \geq 0$ satisfying (6') and (7').

It follows from (6') that the shareholders' profit is

$$\pi R_A + \left(1 - \pi\right)R_B + \pi\left(1 - p_C\right)\left(R_B - R_A\right) - \pi W_A^{***} - \left(1 - \pi\right)W_B^{***}$$
$$= \pi R_A + \left(1 - \pi\right)R_B - \left(1 - \pi\right)\left(1 - p_N\right)E - \bar{u},$$

which is equal to (3). Thus, in Case 1, introduction of legal liability sanctions for breaches of fiduciary duty to shareholders has consequently no effect on managerial incentive schemes. This means that the shareholders prefer Case 1 over Case 3 because, even if the shareholders can efficiently set managerial incentive schemes, their profit in Case 3 becomes (17) which is less than (3). Therefore, it is sufficient to ascertain whether the shareholders choose Case 1 or Case 2.

In Case 2, the manager's participation constraint is (8) because legal liability

sanctions for breaches of fiduciary duty are never imposed on the manager who chooses Project B. The manager's incentive compatibility constraints are

$$W_B - p_C E \geq W_A - (1 - p_C)(R_B - R_A); \tag{9'}$$

$$W_B - (1 - p_N)E \geq W_A - p_N(R_B - R_A).$$

Because the latter inequality is assured by inequality (9'), the shareholders maximize their profit $R_B - W_B$ subject to $W_A \geq 0$, $W_B \geq 0$, (8) and (9'). This is equivalent to minimizing W_B subject to $W_A \geq 0$, $W_B \geq 0$, (8) and (9'). The shareholders have to satisfy the manager's incentive compatibility constraint $W_B \geq p_C E - (1 - p_C)(R_B - R_A)$ that is obtained from inequalities (9') and $W_A \geq 0$. However, the manager's participation constraint is (8). Therefore, the nonnegative constraint of managerial compensation is binding if and only if

$$p_C E - (1 - p_C)(R_B - R_A) > \bar{u} + \{\pi p_C + (1 - \pi)(1 - p_N)\}E, \tag{20}$$

which is equivalent to

$$p_C > \frac{\overline{u} + (1-\pi)(1-p_N)E + R_B - R_A}{(1-\pi)E + R_B - R_A}. \tag{20'}$$

The right-hand side of (20') is greater than that of (18'). That is, introduction of legal liability sanctions for breaches of fiduciary duty to shareholders mitigates the nonnegative constraint of managerial compensation. If (20') is satisfied,

$$W_A^{***} = 0; \tag{10"}$$

$$W_B^{***} = p_C E - (1-p_C)(R_B - R_A). \tag{11"}$$

Point V' in Figure 4 shows the only pair of (W_A^{***}, W_B^{***}) in Case 2 when (20) is satisfied.

When (20) is satisfied, it is more costly for the shareholders to motivate the manager who is directly liable for negative externality to always choose Project B because the shareholders have to pay an additional reward, which is given by $\{p_C E - (1-p_C)(R_B - R_A)\} - [\overline{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E]$, to the manager for obeying

them (acting against social objectives). Then, the shareholders' profit is

$$R_B - W_B^{***} = R_B - \left\{ p_C E - \left(1 - p_C\right)\left(R_B - R_A\right)\right\}. \tag{12"}$$

It follows from (3) and (12") that the following proposition is obtained.

Proposition 4: When managerial compensation cannot be negative, but legal liability sanctions for breaches of fiduciary duty are imposed on the manager, the shareholders motivate the manager to always choose the socially optimal project if and only if

$$p_C > \frac{\pi\left(R_B - R_A\right) + \bar{u} + \left(1-\pi\right)\left(1 - p_N\right)E + R_B - R_A}{E + R_B - R_A}. \tag{19'}$$

The right-hand side of this inequality is greater than that of (19) because $\frac{\pi\left(R_B - R_A\right) + \bar{u} + \left(1-\pi\right)\left(1 - p_N\right)E}{E} < 1$. Inequality (19') can be transformed into

$$\pi\left\{\left(R_B - p_C E\right) - R_A\right\} < \underbrace{\left\{p_C E - \left(1 - p_C\right)\left(R_B - R_A\right)\right\}}_{W_B^{***}} - \underbrace{\left[\bar{u} + \left\{\pi p_C + \left(1-\pi\right)\left(1 - p_N\right)\right\}E\right]}_{W_B^{*}},$$

which shows that introduction of fiduciary duty lowers the right-hand side of this inequality by $\left(1-p_C\right)\left(R_B-R_A\right)$. This corresponds to the shift of point V to V' in Figure 4. If

$$\left(1-p_C\right)\left(R_B-R_A\right) \geq p_C E, \tag{21}$$

the negative constraint of managerial compensation can be perfectly removed by legal liability sanctions for breaches of fiduciary duty. This means that point V' is below point U. Parameters exist satisfying inequality (21) conditional on (18'). It follows from (21) that $p_C < \dfrac{R_B-R_A}{R_B-R_A+E}$ must hold. Then, if p_N is sufficiently large and $\bar{u}$ is sufficiently small, inequality (18') holds for any p_C satisfying $p_C < \dfrac{R_B-R_A}{R_B-R_A+E}$

Thus, introduction of legal liability sanctions for breaches of fiduciary duty to shareholders into managerial incentive schemes can lower the cost of motivating managers to act against social objectives and to obey shareholders. Consequently, this can exacerbate the conflict between shareholders' interests and social objectives. In other words, reinforcement of fiduciary duty can be a substitute for negative compensation imposed on managers for acting against shareholders' interests.

As assumed in (1), it is socially better to prevent the firm from causing negative externality. However, if $R_B - E > R_A$ (i.e., if negative externality can be socially justified), the nonnegative constraint of managerial compensation discourages the manager from adopting a socially optimal project selection, i.e., choosing Case 2. In this case, introduction of legal liability sanctions for breaches of fiduciary duty to shareholders is socially valuable because it encourages the manager to choose Case 2. This means that managers should be directly liable for negative externality under a negligence rule: managers should be punished only when they are found culpable for negative externality (i.e., only when the externality cannot be socially justified). In contrast, under a strict liability rule: when victims are compensated irrespective of whether managers are found culpable or not, managers should be liable for negative externality if they are found culpable for the externality, while shareholders should be liable for negative externality if managers are not found culpable for the externality.

V. Conclusion

The social efficiency of managerial liability rules when firms may cause negative externality has been examined. When courts fail to adequately internalize negative externality, shareholders' interests often are not consistent with social objectives.

Consequently, when a penalty is directly imposed on managers for acting against social objectives, a penalty for acting against shareholders' interests is also necessary to motivate managers to obey shareholders (to act against social objectives). However, shareholders have difficulty in imposing a penalty (negative compensation) on managers without legal processes. Thus, the nonnegative constraint of managerial compensation makes it infeasible to impose the latter penalty on managers; it forces shareholders to pay additional rewards to managers for obeying them. This can raise the cost of motivating managers to act against social objectives and can mitigate the conflict between shareholders' interests and social objectives. However, when shareholders are directly liable for negative externality, the nonnegative constraint of managerial compensation is not binding. Therefore, shareholders motivate managers to obey them (to act against social objectives). Hence, there is a social difference between legal liability for negative externality being imposed on shareholders or on managers. Introduction of legal liability sanctions for breaches of fiduciary duty to shareholders into managerial incentive schemes can be a substitute for negative compensation paid to managers and may exacerbate the conflict between shareholders' interests and social objectives.

Thus, I suggest that managers, not shareholders, should be directly liable for

negative externality caused by corporate activities, and managers' fiduciary duty to shareholders should be restricted. In other words, managers should not just be agents of shareholders who are directly liable for negative externality, and managers' fiduciary duty should be balanced with other legal liabilities imposed on them. This paper provides a new insight into exploring corporate governance in relation to corporate social responsibilities.

Appendix

Proof of Proposition 1: If the legal liability for the external harm E is imposed on the shareholders, the profit maximization problems in Cases 1~3 are as follows.

In Case 1, the shareholders offer the following managerial compensation: paying W_A when R_A is realized and Project B is found liable for negative externality; paying $W_A - \alpha$ when R_A is realized and Project B is found innocent for negative externality; paying W_B when R_B is realized and Project B is found innocent for negative externality; paying $W_B - \beta$ when R_B is realized and Project B is found liable for negative externality. The manager's participation constraint is

$$\pi W_A + (1-\pi)W_B - \pi(1-p_C)\alpha - (1-\pi)(1-p_N)\beta \geq \bar{u}. \tag{A. 1}$$

The manager's incentive compatibility constraints are

$$W_A - (1-p_C)\alpha \geq W_B - p_C\beta;$$

$$W_B - (1-p_N)\beta \geq W_A - p_N\alpha,$$

which are equivalent to

$$(1-p_N)\beta - p_N\alpha \le W_B - W_A \le p_C\beta - (1-p_C)\alpha. \tag{A. 2}$$

The shareholders maximize their profit $\pi R_A + (1-\pi)R_B - (1-\pi)(1-p_N)E - \pi W_A - (1-\pi)W_B + \pi(1-p_C)\alpha + (1-\pi)(1-p_N)\beta$ subject to (A. 1) and (A. 2). This is equivalent to minimizing $\pi W_A + (1-\pi)W_B$ subject to (A. 1) and (A. 2). Therefore,

$$\pi W_A^* + (1-\pi)W_B^* = \bar{u} + \pi(1-p_C)\alpha + (1-\pi)(1-p_N)\beta;$$

$$\bar{u} + (1-p_C)\alpha - (1-\pi)(p_C + p_N - 1)\beta \le W_A^* \le \bar{u} + (1-p_C)\alpha + (1-\pi)(p_C + p_N - 1)\alpha. \tag{A. 3}$$

It follows from (A. 3) that the shareholders' profit is

$$\pi R_A + (1-\pi)R_B - (1-\pi)(1-p_N)E - \pi W_A^* - (1-\pi)W_B^* + \pi(1-p_C)\alpha + (1-\pi)(1-p_N)\beta$$

$$= \pi R_A + (1-\pi) R_B - (1-\pi)(1-p_N) E - \bar{u},$$

which is equal to (3). It is clear that using a single penalty system (i.e., using only α or only β), the manager can be motivated to choose Case 1.

In Case 2, the shareholders maximize their profit $R_B - \{\pi p_C + (1-\pi)(1-p_N)\} E - W_B$ subject to the participation constraint $W_B \geq \bar{u}$ and the incentive compatibility constraint $W_B \geq W_A$. In this case, the shareholders need not impose any penalty on the manager because an inequality $W_B \geq W_A$ is sufficient to motivate him/her to always choose Project B. Therefore,

$$W_B^* = \bar{u}; \tag{A. 4}$$

$$W_A^* \leq \bar{u}. \tag{A. 5}$$

It follows from (A. 4) that the shareholders' profit is

$$R_B - \{\pi p_C + (1-\pi)(1-p_N)\} E - W_B^* = R_B - \{\pi p_C + (1-\pi)(1-p_N)\} E - \bar{u},$$

which is equal to (12).

In Case 3, the shareholders maximize their profit $R_A - W_A$ subject to the participation constraint $W_A \geq \bar{u}$ and the incentive compatibility constraint $W_A \geq W_B$. As in Case 2, the shareholders need not impose any penalty on the manager because an inequality $W_A \geq W_B$ is sufficient to motivate him/her to always choose Project A. Therefore,

$$W_A^* = \bar{u}\,; \tag{A. 6}$$

$$W_B \leq \bar{u}\,. \tag{A. 7}$$

It follows from (A. 6) that the shareholders' profit is (17).

Hence, there is no social difference between whether legal liability for negative externality is directly imposed on the shareholders or on the manager.

Proof of Proposition 2: Because the shareholders prefer Case 1 to Case 3, it is sufficient to ascertain the condition under which the shareholders prefer Case 1 to Case 2, i.e., the condition under which (3) is greater than (12'). This condition is given by

$$R_B - p_C E < \pi R_A + (1-\pi) R_B - (1-\pi)(1-p_N) E - \bar{u},$$

which is equivalent to (19).

Proof of Proposition 3: It follows from (6') that W_B^{***} is a decreasing function of W_A^{***} and $W_B^{***} = \dfrac{\bar{u} + \pi(1-p_C)(R_B - R_A)}{1-\pi} + (1-p_N)E > 0$ is satisfied when $W_A^{***} = 0$. Let (W_A^1, W_B^1) denote a pair of (W_A, W_B) that maximizes W_A subject to (6') and (7'). Let (W_A^2, W_B^2) denote a pair of (W_A, W_B) that maximizes W_B subject to (6') and (7'). Solving (6') and (7') yields

$$W_A^1 = \bar{u} + \{\pi(1-p_C) + (1-\pi)p_N\}(R_B - R_A) > 0;$$

$$W_B^2 = \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\} E > 0.$$

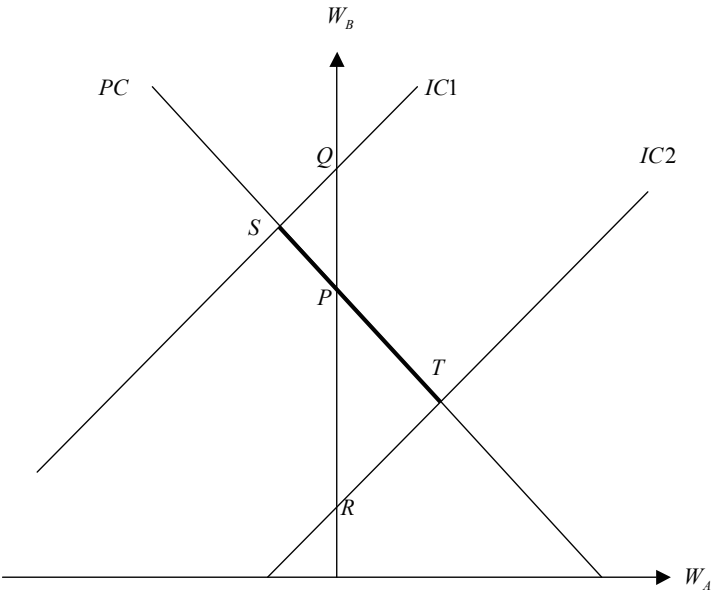
If $W_A^2 \geq 0$, then $0 \leq W_A^2 < W_A^1$ and $0 < W_B^2$ are satisfied. Hence, a pair of (W_A^2, W_B^2) is an example of (W_A^{***}, W_B^{***}) satisfying Proposition 3. If $W_A^2 < 0$, then $W_A^2 < 0 < W_A^1$ and $W_B^2 > \dfrac{\bar{u} + \pi(1-p_C)(R_B - R_A)}{1-\pi} + (1-p_N)E > 0$ are satisfied. Hence, a

pair of $\left(0, \frac{\bar{u} + \pi\left(1 - p_C\right)\left(R_B - R_A\right)}{1 - \pi} + \left(1 - p_N\right)E\right)$ is an example of $\left(W_A^{***}, W_B^{***}\right)$ satisfying Proposition 3.

Proof of Proposition 4: It follows from (1) that (19') assures (20). Therefore, the shareholders motivate the manager to always choose the socially optimal project if and only if (3) is greater than (12"), i.e., if and only if

$$R_B - \left\{p_C E - \left(1 - p_C\right)\left(R_B - R_A\right)\right\} < \pi R_A + \left(1 - \pi\right)R_B - \left(1 - \pi\right)\left(1 - p_N\right)E - \bar{u},$$

which is equivalent to (19').



PC : the borderline of the participation constraint

$$\pi W_A + (1-\pi)W_B - (1-\pi)(1-p_N)E = \bar{u};$$

$IC1$: the borderline of the incentive constraint

when the firm will cause negative externality $W_B - p_C E = W_A$;

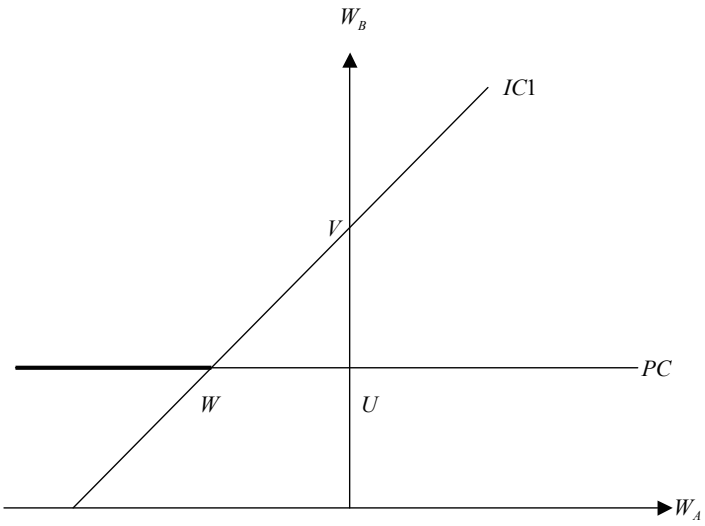
$IC2$: the borderline of the incentive constraint

when the firm will involve no negative externality $W_B - (1-p_N)E = W_A$;

P: $\left(0, \bar{u}/(1-\pi) + (1-p_N)E\right)$; Q: $\left(0, p_C E\right)$; R: $\left(0, (1-p_N)E\right)$;

S: $\left(\bar{u} - (1-\pi)(p_C + p_N - 1)E, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E\right)$; T: $\left(\bar{u}, \bar{u} + (1-p_N)E\right)$

Figure 1



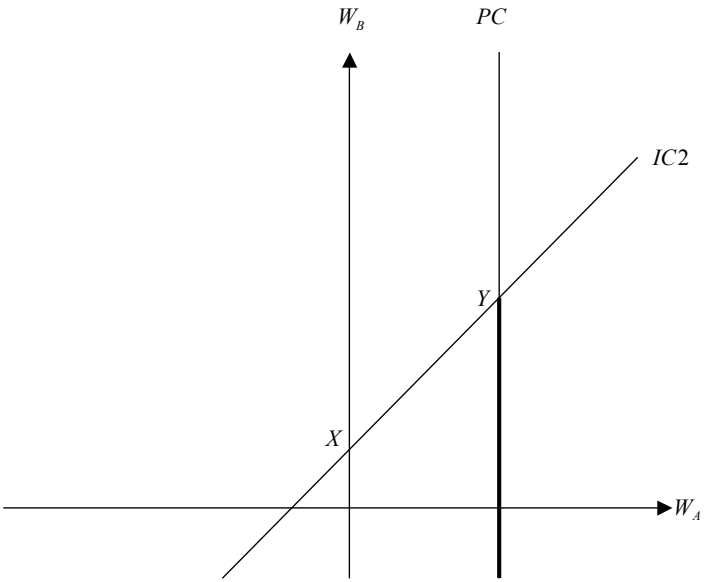
PC: $W_B - \{\pi p_C + (1-\pi)(1-p_N)\}E = \bar{u}$;

$IC1$: $W_B - p_C E = W_A$;

U: $\left(0, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E\right)$; V: $(0, p_C E)$;

W: $\left(\bar{u} - (1-\pi)(p_C + p_N - 1)E, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E\right)$

Figure 2

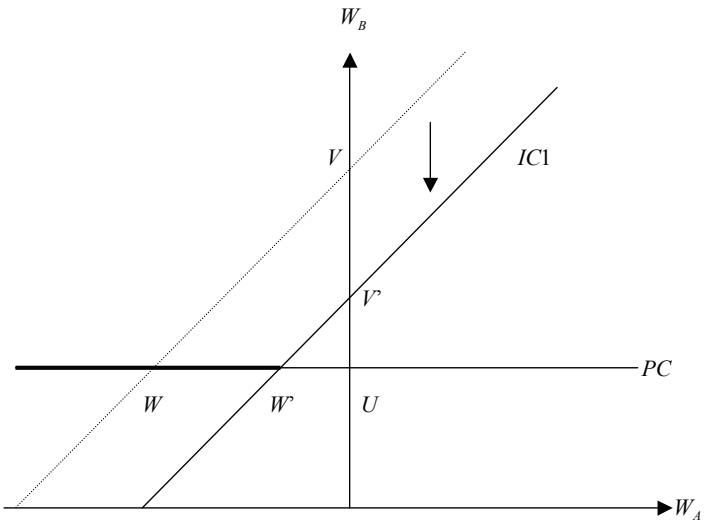


PC: $W_A = \overline{u}$;

$IC2$: $W_B - (1 - p_N)E = W_A$;

X: $(0, (1 - p_N)E)$;　Y: $(\overline{u}, \overline{u} + (1 - p_N)E)$;

Figure 3



PC: $W_B - \{\pi p_C + (1-\pi)(1-p_N)\}E = \bar{u}$;

$IC1$: $W_B - p_C E = W_A$;

U: $(0, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E)$; V: $(0, p_C E)$; V': $(0, p_C E - (1-p_C)(R_B - R_A))$;

W: $(\bar{u} - (1-\pi)(p_C + p_N - 1)E, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E)$;

W': $(\bar{u} + (1-p_C)(R_B - R_A) - (1-\pi)(p_C + p_N - 1)E, \bar{u} + \{\pi p_C + (1-\pi)(1-p_N)\}E)$

Figure 4

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